

REMARKS

The specification has been amended in order to correct grammatical and idiomatic errors contained therein. No new matter has been added.

In order to expedite the prosecution of the present application, the subject matter of Claim 2 has been incorporated into Claim 1. Accordingly, Claim 2 has been canceled. Additionally, Claim 3 has been amended to state that the catalyst contains crystalline metastannic acid. No new matter has been added.

Claim 1 has been rejected under 35 USC 102(b) as being anticipated by Matsuhashi. Claims 3 and 4 have been rejected under 35 USC 102(b) as being anticipated by Kawamata et al. Claim 2 has been rejected under 35 USC 103(a) as being unpatentable over Matsuhashi in view of Obara et al. Applicants respectfully traverse these grounds of rejection and urge that the currently presented claims are patentably distinguishable over the prior art cited by the Examiner.

The presently claimed invention is directed to a solid acid catalyst containing crystalline metastannic acid and having a tin content of not less than 30% by weight as metal in the catalyst, a sulfate group supported thereon and an absolute value of argon adsorption heat of 30 kJ/mol or more and is used in acid-catalytic reactions, and a method of preparing this solid acid catalyst.

As discussed in the present specification, the present invention is based on the discovery that a solid acid catalyst comprising crystalline metastannic acid has an unexpectedly high catalytic activity in esterification and transesterification reactions. It is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

The Matsuhashi article discloses the preparation of a highly active solid superacid of sulfated tin oxide from tin oxide gel, which was precipitated by the hydrolysis of  $\text{SnCl}_4$ .

and washed with an aqueous ammonium acetate solution, followed by exposure to aqueous sulfuric acid and calcining. The present invention is distinguishable over the composition of Matsuhashi in that Matsuhashi requires the use of a tin oxide gel from  $\text{SnCl}_2$  while the method of currently presented Claim 1 requires the use of a support comprising a crystalline metastannic acid. As will be discussed further below, it is critical that a crystalline metastannic acid be contained in the catalytic composition of the present invention. As such, it is respectfully submitted that the presently claimed invention is patentably distinguishable over this reference.

The Kawamata et al reference discloses a process for the selective ortho-alkylation of phenolic compounds using a catalyst comprising chromium oxide, tin oxide, iron oxide, and a sulfate radical in a proportion of a chromium:tin:iron:sulfur atomic ratio ranging from 100:0.1:0.01:0.25 to 100:60:20:20 or contains chromium oxide, tin oxide and a sulfate radical in a proportion of a chromium:tin:sulfur atomic ratio ranging from 100:0.1:0.25 to 100:60:20. In the Office Action, the Examiner states that a conversion of the atomic ratios to weight percentages results in tin contents exceeding 30 wt.%. However, although the catalyst disclosed in this reference can meet the requirements of Claims 3 and 4 with respect to the tin content, the catalyst of this reference does not meet the remaining limitations of Claims 3 and 4. That is, Claim 3 also requires that the catalyst contain crystalline metastannic acid and that it have an absolute value of argon adsorption heat of 30 kJ/mol or more and Claim 4 further limits Claim 3 in requiring that, in the infrared reflection spectrum of the catalyst, the reflectance at  $1280 \text{ cm}^{-1}$  is less than the reflectance at  $1220 \text{ cm}^{-1}$ . Therefore, it is respectfully submitted that the currently presented claims clearly are patentably distinguishable over this reference.

The Obara et al reference discloses a process for preparing a stannic oxide hydrate which is substantially

amorphous with respect to X-ray diffraction and has bound water in the range of about 0.5 to about 0.7 mole of water per mole of SnO<sub>2</sub>. The stannic oxide hydrate is a flame-resistant agent which is incorporated into an aqueous spinning dope containing a chlorine-containing polymer and polyvinyl alcohol as main polymer ingredients. In this reference, it is critical that the stannic oxide is amorphous and not crystalline and it must have the specified amount of bound water in order to obtain an aqueous spinning dope having a superior stability, filtering property and spinning property (column 3, line 60, through column 4, line 2). Although this reference does disclose that the specified stannic oxide hydrate is preferably prepared by wet-heat-treating β-stannic acid, the stannic oxide hydrate of this reference has to be amorphous and, as such, this reference does not disclose the preparation of crystalline metastannic acid. Moreover, since the amorphous stannic oxide hydrate is used as a flame-resistant agent and not as a catalyst support, there is no suggestion in this reference which would motivate one of ordinary skill in the art regarding the applicability of the amorphous stannic oxide acid disclosed therein as an equivalent of crystalline metastannic acid as required by the catalytic composition of the present invention. Therefore, it is respectfully submitted that the combination of Matsuhashi and Obara et al does not even present a showing of prima facie obviousness under 35 USC 103(a) with respect to the presently claimed invention.

Although the prior art cited by the Examiner does not even make a showing of prima facie obviousness under 35 USC 103(a), objective evidence is of record in the present application which is more than sufficient to rebut any proper prima facie obviousness rejection under 35 USC 103(a). In the Examples contained on pages 7-11 of the present specification, a sulfated tin oxide catalyst MO-858 is prepared as discussed in the experimental section of Matsuhashi. As is readily evident from comparing the results of catalyst MO-858 with

catalyst MO-815 of the present invention, comparative catalyst MO-858, corresponding to the Matsuhashi catalyst, has an argon adsorption heat of -29.7 kJ/mol, which is lower than 30 kJ/mol, and exhibits a much lower conversion rate than the catalyst of the present invention in the transesterification and esterification reactions due to its low catalytic activity. This is clearly unexpected in light of the prior art cited by the Examiner and further establishes the patentability of the presently claimed invention thereover.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,



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